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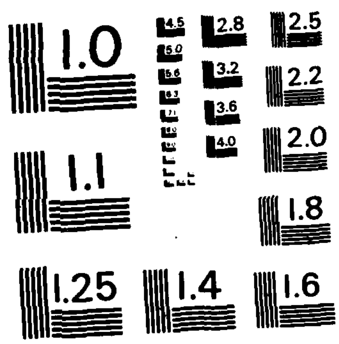

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IMPROVED DISTRIBUTION THROUGH CONTROLLED ROTATIONAL FLOW OF PERSONNEL

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The objective of this effort was to develop a strategy for improving distribution by the dynamic control of personnel rotational flows. A rotation simulation model was developed based on the concept of minimum tour lengths and flexible projected rotation dates (PRDs). Rotational flows were controlled to achieve sea distribution goals by length of service (LOS). The operations specialist (OS) rating was empirically tested.

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To achieve sea distribution goals for the OS rating, the model simulated sea tour lengths of 8 years for a small percentage of personnel commencing sea duty in the first 3 years of service. Adding a 5-year maximum sea-tour constraint while retaining the minimum shore-tour length at 1 year degraded the sea distribution slightly. In contrast, increasing the minimum shore tour to 2 years caused a significant degradation in sea distribution.

FOREWORD

This research and development was performed in support of Navy decision coordinating paper Z1170-002 (Fleet Demand for Base Operating Support Manpower) under the Manpower Utilization subproject and was sponsored by the Deputy Chief of Naval Operations (Manpower, Personnel, and Training). The objective of this subproject is to conduct a systematic assessment of the feasibility and impact of alternative maintenance/assignment strategies on manpower utilization.

This report is the second in a series relating to sea-shore rotation management. The first (NPRDC SR 83-15) documented an attempt to quantify the interrelationships of personnel losses, promotions, and tour lengths, and their impact on Navy manning by pay grade and type duty distribution. This effort develops a rotation simulation model that tests a strategy for improving sea-shore distribution through the dynamic control of personnel rotational flows. The strategy is based on minimum rather than maximum tour lengths and flexible tour lengths/projected rotation dates (PRDs) by length of service (LOS).

The model was developed by Rehab Group, Inc. of San Diego, California under contract N00123-81-D-0588. The contracting officer's technical representative was Mr. Thomas A. Blanco.

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SUMMARY

Problem

Sea/shore rotational flows under current rotation policy aggravate existing distribution imbalances (personnel shortages and overages by pay grade and duty type), particularly in the middle pay grades (E-5 and E-6) of the sea-intensive ratings. Empirical analysis of the type duty distribution for the boiler technician (BT) and operations specialist (OS) ratings reveals the need for methods of controlling rotational flows to improve distribution balance.

Purpose

The purpose of this effort was to develop a strategy for improving distribution by the dynamic control of personnel rotational flows.

Approach

The approach used in this work involved four steps: (1) development of a sea distribution goal by length of service (LOS), (2) definition of rotational cohorts, (3) development of a model simulating LOS rotational flow controlled by the sea distribution goal, and (4) utilization of the model to estimate the distribution effects of controlled rotational flow. The OS rating was empirically tested using this model.

Results

To achieve sea distribution goals for the OS rating, the model simulated sea tour lengths of 8 years for a small percentage of personnel commencing sea duty in the first 3 years of service. Distribution balance at both sea and shore was improved. Adding a 5-year maximum sea-tour constraint, while retaining the minimum shore-tour length at 1 year, degraded the sea distribution slightly. In contrast, increasing minimum shore tour length to 2 years caused a significant degradation in sea distribution.

Conclusions

Distribution balance can be improved by controlling sea/shore rotation flows in response to changing requirements. The methodology used to establish this conclusion is founded on a LOS-based sea distribution goal and rotation of LOS cohorts as a function of LOS and time-in-tour. This approach is a departure from the traditional approach of attempting to analyze and control rotational flow by pay grade.

Current sea/shore tour lengths are fixed by pay grade and make improved distribution for the OS rating unlikely. The proposed methodology allows for flexible sea- and shore-tour lengths based on distribution requirements by LOS.

Recommendation

Feasibility assessment and implementation considerations should be based on evaluation of several representative detailing communities to find whether significant distribution improvements can be achieved and whether the methodology can be practically implemented into the distribution control and assignment process.

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INTRODUCTION

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The Navy's enlisted personnel distribution system is designed to rotate people from sea to shore and from one job to another. In general, the rotational flow of Navy enlisted personnel is triggered by the projected rotation date (PRD) assigned each individual with each ordered change of duty. The PRDs for a "distributable community" are assigned based on standard tour lengths usually determined by considering sea/shore billet ratios for each pay grade and the maximum/minimum tour length policies for sea and shore duty. This system for controlling rotational flow is referred to in this report as the "supply-based" system.

Sorenson and Cass (1983) demonstrated the complex interrelationship of losses, promotions, and tour lengths, and their impact on Navy manning (personnel levels). They showed that sea/shore rotation tradeoffs involve much more than simple proportional adjustments to tour lengths.

"Supply-based" rotational flow produced by current sea/shore rotation policy has aggravated distribution imbalances (personnel shortages and overages by pay grade and duty type), particularly in the middle pay grades (E-5 and E-6) of the sea-intensive ratings. Figure 1 illustrates these imbalances. Empirical analysis of the boiler technician (BT) and operations specialist (OS) ratings reveals the need for improved methods for controlling rotational flow to improve sea/shore distribution.

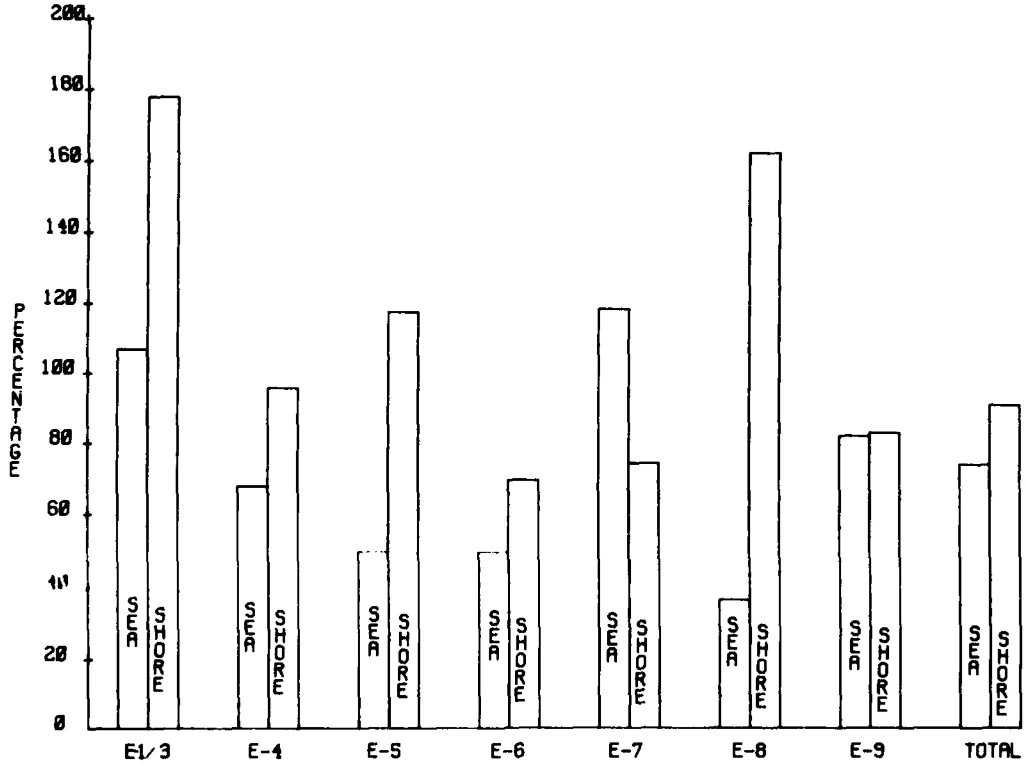

Figure 1. End-FY81 OS sea/shore distribution (personnel/billets percentage) from STF data.

Objective

The objective of this effort was to develop a strategy for improving distribution by the dynamic control of rotational flows. A "demand-driven" sea/shore rotation model was developed to support the investigation. Work to date has focused on a single rating (OS), with particular attention being given to modeling length of service (LOS) based rotational flows to achieve calculated sea distribution goals (also LOS-based).

Background

Previous work (Cass & Sorensen, 1982) investigated simulated rotation controlled by a vector of tour lengths representing the average assigned tour length for the first sea tour, first shore tour, second sea tour, etc. The objective was to determine tour length vectors that would approximate observed type duty distribution patterns, and then determine tour length vectors that would improve type duty distribution. Although the model developed could simulate observed sea/shore distribution patterns and approach a desired distribution goal, the iterative trial-and-error techniques necessary to determine "optimal" tour parameters made the model impractical. This work suggests that "blanket" tour lengths (i.e., unvarying assigned tour lengths for a given tour or for a given pay grade) may not permit the flexibility needed to respond to existing (and frequently changing) supply/demand relationships.

Concurrent investigation (Cass & Sorensen, 1982) of the effect of changing from one set of tour parameters to another revealed that distribution may degrade during the transition period, and that the steady-state distribution would probably never be achieved because of the frequent changes in personnel supply and demand relationships.

The simulation approach reported here is, in some respects, similar to the rotation simulation used in the force analysis simulation model (FASM) (Neches, Lightwood, & Opstad, 1982). FASM uses minimum and maximum tour length constraints and drives rotation to achieve satisfaction of "hard sea requirements." Sea and shore tour lengths are determined for each pay grade. FASM did not address the distribution level and rotational flows occurring during the transition period from one set of rotation parameters to another, nor did it treat the effect of transients, patients, separatees, and disciplinary (TPS&D) or student/trainee status. Further, it did not allow varying tour lengths for a given tour.

APPROACH

The approach used in this work involved four steps: (1) development of a sea distribution goal by LOS, (2) definition of rotational cohorts, (3) development of a model simulating LOS rotational flow controlled by the sea distribution goal, and (4) utilization of the model to estimate the distribution effects of controlled rotational flow. With this approach, the OS rating was empirically tested.

Development of a Sea Distribution Goal by LOS

Distribution consideration requires the comparison of billets to personnel, defined by pay grade and sea/shore status. However, since the pay grade and the sea/shore status of personnel are a function of LOS, a measure of sea and shore billets related to LOS was required to develop meaningful distribution goals.

Distribution goals were developed in the form of a desired sea-duty percentage for each LOS population. These were determined from the authorized sea and shore billets by pay grade, the LOS-pay grade distribution of the OS population, and the LOS distribution of the "nondistributable" population (i.e., TPS&D and students/trainees). It is assumed that the population at each LOS is divided between sea, shore, and TPS&D (including students). The requirements curve for the sea requirements is calculated by (1) computing the ratio of sea billets to total billets for each pay grade, (2) computing the pay grade-weighted sea ratio for each LOS, and (3) adjusting the sea ratio for TPS&D. This calculation is summarized below:

Sea Distribution Goal for LOS y

$$= (100 - TPS\&D_y) \times \sum_{p=3}^{9} \left(\frac{CBp}{TBp} \times \frac{Pp,y}{TPy} \right) \tag{1}$$

where CBp = Sea billets, pay grade p
TBp = Total billets, pay grade p
TPy = Total personnel, LOS y
Pp,y = Personnel pay grade p, LOS y
TPS&Dy = Percentage TPS&D for LOS y

Figure 2 compares the sea distribution goals an the observed end-FY81 sea distribution for the OS population.

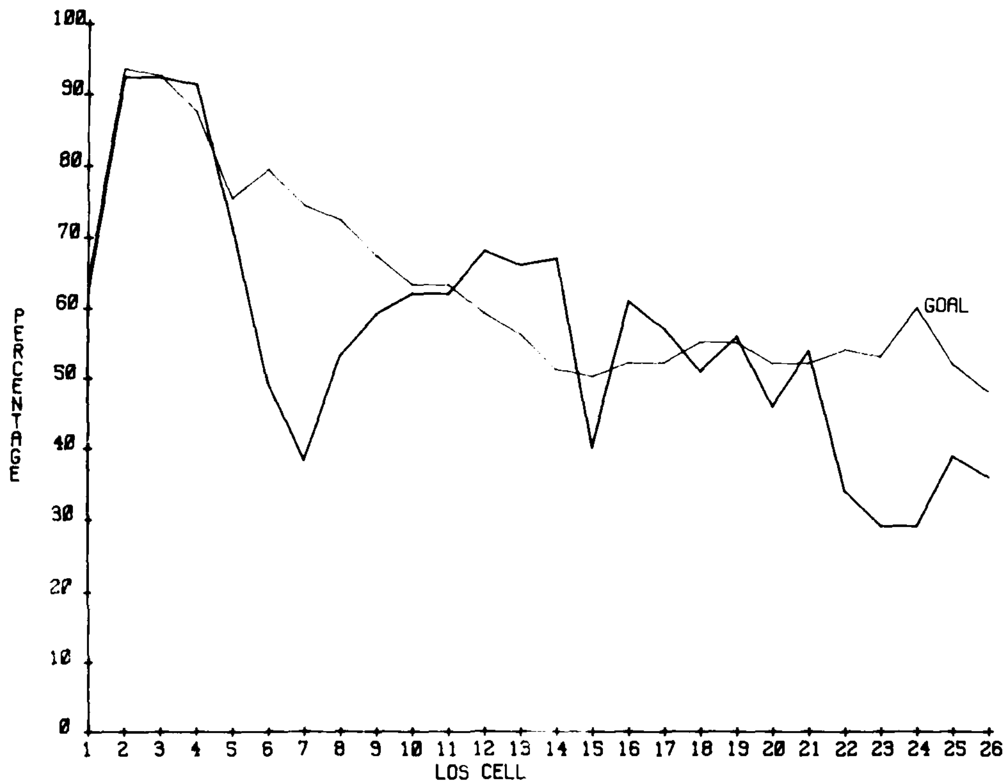

Figure 2. End-FY81 sea distribution (percentage LOS population on sea duty) vs. sea distribution goals for OS population.

Definition of Rotational Cohorts

Rotational cohorts were defined by sea/shore status and by the LOS at which that status commenced. Each cohort was further subdivided by time-in-tour. For example, to model the rotation for LOS 1 through LOS 25, 25 sea duty cohorts and 25 shore duty cohorts were defined. (Note that pay grade was not used as a definition parameter.) Each of these 50 cohorts was divided into subsets corresponding to the time (in years) served in that tour.

Development of a Model Simulating Rotational Flow Controlled by the Sea Distribution Goal

The rotation simulation model calculates the percentage of each LOS population on sea and shore duty. (The model rotation includes TPS&D in shore duty--TPS&D is subtracted from shore prior to calculating shore distribution.)

The starting sea/shore distribution is the goal distribution for LOS 1. Rotation is mandatory at maximum tour length. The model executes rotation from the senior time-in-tour cells at LOS y to the opposite type duty at cell LOS y+1, time-in-tour 1. For each LOS, after the mandatory rotation, the resulting sea distribution is compared to the goal distribution. If the resulting distribution is different (i.e., greater or less) than the goal distribution, rotation occurs from sea to shore (greater) or shore to sea (less) to make up as much as possible, if not all, the difference from the LOS population that has served the minimum tour length. The remainder of the unrotated population is then aged in LOS and time-in-tour. Table 1 is an example of the output from the rotation model. The rotation simualtion model can be run in either the steady-state or transition model.

Steady-state Mode

In the steady-state mode, the model simulates the type duty distribution and the annual rotation flow resulting from a full 30 years of rotation with the same min/max tour lengths and a constant distribution goal.

The rotation simulation starts with LOS 1--rotating and aging each LOS population sequentially to arrive at the steady-state distribution.

Transition Mode

In the transition mode, the model simulates the type duty distribution and rotation flow occurring in sequential 1-year intervals when new rotation control parameters are applied to an existing distribution. The existing distribution is defined by type duty, LOS, and time-in-tour. For this report, the observed FY81 distribution from survival tracking file (STF) data, by type duty and LOS, is used as the starting distribution. The time-in-tour distribution is model-estimated.

The rotation simulation proceeds 1 year at a time, rotating and/or aging each LOS population from LOS 29 to LOS 1. The distribution at LOS y+1 is determined from the aging and rotation of the distribution at LOS y. The LOS y distribution is then "zeroed" prior to receiving the distribution from LOS y-1. The LOS 1 distribution is set to the goal distribution. The type duty and PRD distribution are analyzed for each 1-year period.

Table 1

Percentage of LOS Population Distributed to Sea and Shore

	Cohort Time-in-tour (Years)										
	Sea Distribution							Shore Distribution			
Cohort LOS	1	2	3	4	5	Total	Goal	1	2	3	Total
1	63	0	0	0	0	63	63	37	0	0	37
2	30	63	0	0	0	93	93	0	7	0	7
3	7	30	55	0	0	92	92	8	0	0	8
4	0	7	30	50	0	87	87	5	8	0	13
5	8	0	7	30	30	75	75	20	5	0	25
6	5	8	0	7	30	50[a]	79	30	20	0	50
7	20	5	8	0	7	40[a]	74	30	30	0	60
8	30	20	5	8	0	63[a]	72	7	30	0	37
9	30	30	7	0	0	67	67	26	7	0	33
10	7	30	26	0	0	63	63	11	26	0	37
11	26	7	30	0	0	63	63	26	11	0	37
12	11	26	7	15	0	59	59	15	26	0	41
13	26	11	19	0	0	56	56	29	15	0	44
14	15	26	10	0	0	51	51	20	29	0	49
15	0	15	26	9	0	50	50	1	20	29	50
16	29	0	15	8	0	52	52	27	1	20	48
17	21	29	0	0	0	50[a]	52	23	27	0	50
18	5	21	29	0	0	55	55	0	23	22	45
19	29	5	21	0	0	55	55	29	0	16	45
20	16	29	5	0	0	50[a]	52	21	29	0	50
21	7	16	29	0	0	52	52	5	21	22	48
22	31	7	16	0	0	54	54	29	5	12	46
23	15	31	7	0	0	53	53	16	29	9	47
24	14	15	31	0	0	60	60	7	16	17	40
25	23	14	15	0	0	52	52	31	7	10	48

[a]Total Distribution different than Goal Distribution.

Max/Min Sea-tour Length = 5.0/2.0
(Max Sea-tour Length for LOS > 13 = 3)

Max/Min Shore-tour Length = 3.0/2.0
(Max Shore-tour Length for LOS < 13 = 2)
(Min Shore-tour Length for LOS 1 = 1)

Cohort Rotations

Each cohort is defined as the percentage of an LOS population starting sea or shore duty at that LOS and the percentage of succeeding LOS populations still in that tour. The cohort analysis required simply finds the cohort rotations distribution; that is, the quantity of each cohort (type duty, LOS) rotating at each succeeding time-in-tour interval. Table 2 represents the rotations required for each sea duty LOS cohort each year for the steady-state distribution shown in Table 1.

Table 2

Sea Duty LOS Cohort Rotations

Cohort LOS[a]	Cohort Time-in-tours (Years) 1	2	3	4	5
Percentage of LOS Population					
1	0	8	5	20	30
2	0	0	0	0	30
3	0	0	0	0	7
4	0	0	0	0	0
5	0	0	0	0	0
6	0	0	2	0	0
7	0	13	7	0	0
8	0	4	26	0	0
9	0	0	15	15	0
10	0	0	7	0	0
11	0	7	19	0	0
12	0	1	1	9	0
13	0	0	18	8	0
14	0	0	15	0	0
15	0	0	0	0	0
16	0	0	29	0	0
17	0	0	21	0	0
18	0	0	5	0	0
19	0	0	29	0	0
20	0	0	16	0	0
Estimated from FY81 Population					
1	0	154	61	194	260
2	0	0	0	0	143
3	0	0	0	0	29
4	0	0	0	0	0
5	0	0	0	22	0
6	0	0	14	0	0
7	0	36	19	0	0
8	0	11	76	0	0
9	0	0	26	23	0
10	0	0	11	0	0
11	0	11	23	0	0
12	0	1	1	7	0
13	0	0	15	5	0
14	0	0	9	0	0
15	0	0	0	0	0
16	0	0	31	0	0
17	0	0	19	0	0
18	0	0	5	0	0
19	0	0	21	0	0
20	0	0	8	0	0

[a]Cohort LOS is the LOS of the cohort on commencement of sea duty.

The rotation percentages shown apply to LOS populations where the LOS of the population equals the cohort LOS plus the time-in-tour minus one. For example, the rotation percentage shown for cohort (LOS = 1, time-in-tour = 5) applies to the LOS population 5 (1 + 5 - 1 = 5).

Table 2 also shows the rotation percentages applied to the FY81 OS population to show the estimated number of rotations for each cohort at steady-state conditions.

The estimated number of rotations per year, by pay grade, could be used to estimate the PCS impact for different rotation parameters.

Distribution Determination from Rotation Simulation

The output of the rotation simulation is the type duty distribution (sea, shore) of each LOS population by time-in-tour. The distribution is expressed in percentage; the summation of the distribution for each LOS is 100. To obtain population distribution comparison, the rotation distribution is summed over the time-in-tour dimension to obtain the distribution by type duty and LOS. The product of this distribution and the target population (defined as number of personnel by pay grade, LOS) yields the population distribution by type duty and pay grade. The target population may be from historical data (STF), current data (e.g., the Enlisted Master Record (EMR)), or model-estimated population (which allows estimation of the effect of changes to attrition and/or promotion parameters). For this report, historical data from the STF are used.

Utilization of the Model to Estimate the Effects of Controlled Rotational Flow

Historical sea/shore distribution and population data were obtained from the survival tracking file (STF) (Gay & Borack, 1981, 1982). Authorized billets for the OS detailing community, required for distribution comparison, were obtained from the end-FY81 enlisted billets file. By applying the model and generating a sea/shore distribution for the observed OS population, the observed distribution and the distribution obtained by controlling the rotational flow could be compared.

In the steady-state mode, the rotation simulation model was used to find (1) the tour lengths required and the resultant distribution when the sea distribution goal is attained, and (2) the impact on distribution as the tour lengths are constrained to more "practical" values.

In the transition mode, the model was used to find (1) the time required to reach steady-state rotational flow (and PRD distribution), (2) the impact on distribution during the transition period, and (3) the time required to reach steady-state distribution.

RESULTS

Tour Lengths Required to Attain Exactly Sea Distribution Goal

For the early LOS cohorts, a long maximum sea tour length (8 years) and a short minimum shore tour length (1 year) were required to match exactly the distribution goal for the OS community. Although the 8-year maximum sea tour length was required for the cohorts commencing sea duty in LOS 1, 2, and 3, relatively few personnel experienced sea tours longer than 5 years. Table 3 shows the estimated sea-duty population for each rotational cohort by time-in-tour. Note that approximately 6 percent of the OS

Table 3

Estimated Sea-duty Cohort Population by Time-in-tour for End-FY81 OS Population Distributed to Achieve Sea Distribution Goal

Cohort LOS[a]	Cohort Time-in-tour (Years) 1	2	3	4	5	6	7	8
1	1436	1204	658	492	260	138	16	3
2	573	359	295	260	143	123	82	3
3	84	69	61	33	29	19	19	3
4	--	--	--	--	--	--	--	--
5	69	38	33	22	22	24	--	--
6	24	21	14	14	15	--	--	--
7	82	55	55	59	7	--	--	--
8	3	3	3	2	--	--	--	--
9	69	74	44	29	--	--	--	--
10	9	5	5	--	--	--	--	--
11	53	46	23	4	2	1	--	--
12	11	8	8	6	4	--	--	--
13	36	35	25	18	--	--	--	--
14	13	9	7	--	--	--	--	--
15	--	--	--	--	--	--	--	--
16	1	2	2	--	--	--	--	--
17	50	50	43	--	--	--	--	--
18	5	5	5	--	--	--	--	--
19	2	2	1	--	--	--	--	--
20	45	33	23	--	--	--	--	--
Total	2565	2018	1305	939	482	305	117	9
PCT	33	26	17	12	6	4	2	.1

[a]Cohort LOS is LOS at which sea tour commenced.

population starting sea duty at LOS less than 21 years experienced sea tours longer than 5 years. For sea cohorts LOS 4-12, 3- to 6-year sea tour lengths were required; and for LOS 13-20, 3- to 4-year sea tour lengths. As shown in Figure 3, distribution balance is improved for E-5s, E-6s, E-7s, E-9s, and for the community total, as compared to FY81 distribution (see Figure 1).

Table 4 shows the estimated population on shore duty. To keep the maximum sea tour length at 8 years, it was necessary to ensure short maximum shore tours for the early-LOS cohorts. The results shown here were obtained by setting the maximum shore tour length at 2 years for LOS less than 13 years.

Distribution Effect of Minimum/Maximum Tour Length Constraints

Assuming tour lengths greater than 5 years would not be allowed, the steady-state mode was used to determine the effect of this constraint on distribution.

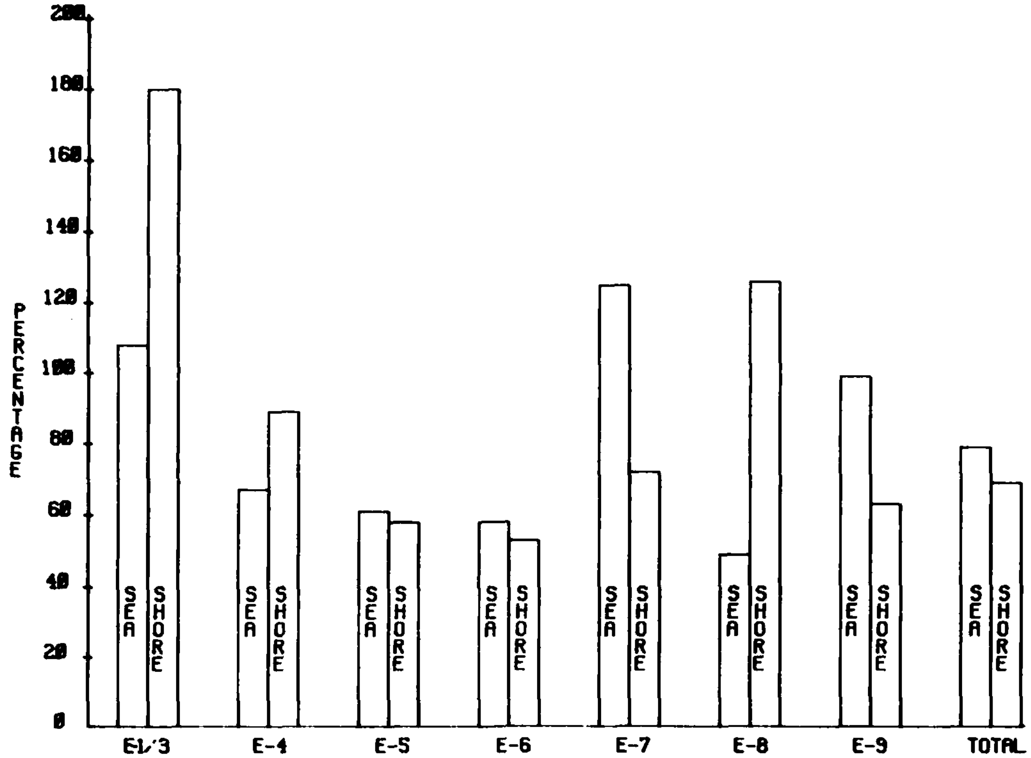

Figure 3. Distribution for tour length constraints (8/1--4/1).

Table 4

Estimated Shore-duty Cohort Population by Time-in-tour for End-FY81 OS Population Distributed to Achieve Sea Distribution Goal

Cohort LOS[a]	Cohort Time-in-tour (Years)							
	1	2	3	4	5	6	7	8
1	844	134	--	--	--	--	--	--
2	--	--	--	--	--	--	--	--
3	96	79	--	--	--	--	--	--
4	49	43	--	--	--	--	--	--
5	173	95	--	--	--	--	--	--
6	5	4	--	--	--	--	--	--
7	103	69	--	--	--	--	--	--
8	8	8	--	--	--	--	--	--
9	83	89	--	--	--	--	--	--
10	21	12	--	--	--	--	--	--
11	53	46	--	--	--	--	--	--
12	17	13	--	--	--	--	--	--
13	40	39	27	19	--	--	--	--
14	19	13	10	--	--	--	--	--
15	1	1	--	--	--	--	--	--
16	--	--	--	--	--	--	--	--
17	53	47	39	--	--	--	--	--
18	--	--	--	--	--	--	--	--
19	2	--	--	--	--	--	--	--
20	48	31	20	--	--	--	--	--

[a]Cohort LOS is LOS at which shore tour commenced.

Surprisingly, the sea distribution proved to be more sensitive to the minimum shore tour length than to the maximum sea-tour length. Dropping the maximum sea-tour length from 8 to 5 years while retaining the minimum shore-tour length at 1 year degraded the sea distribution slightly. Table 5 shows the steady-state sea distribution obtained for various combinations of maximum/minimum sea and shore tour lengths, and the FY81 sea distribution for comparison. As shown, E-4 and E-5 sea distribution degrades slightly when the tour lengths are changed from 8/1--4/1 to 5/1--4/1. Figure 4 shows graphically the change in the sea distribution curve.

Table 5

End-FY81 Sea Distribution vs. Steady-state Model Distribution of End-FY81 Population

Tour Length (Max/Min)		Pay Grade							
Sea	Shore	E-1/3	E-4	E-5	E-6	E-7	E-8	E-9	Total
8/1	4/1	1.08	0.67	0.61	0.58	1.25	0.48	0.98	0.79
5/1	4/1	1.08	0.66	0.58	0.58	1.25	0.48	0.98	0.78
5/2	4/2	1.08	0.64	0.50	0.54	1.25	0.48	0.97	0.75
5/2	3/2	1.08	0.64	0.52	0.54	1.24	0.48	0.98	0.76
5/2	3/1	1.08	0.66	0.59	0.58	1.25	0.48	0.98	0.79
FY81		1.07	0.68	0.50	0.49	1.19	0.37	0.83	0.75

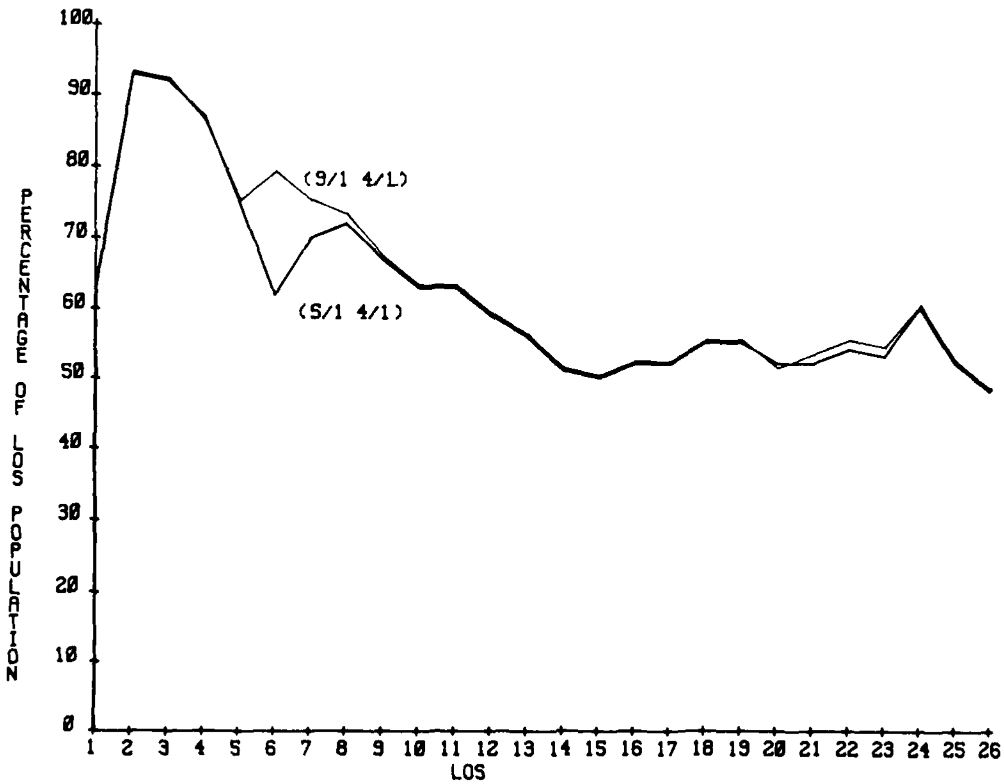

Figure 4. Steady-state model sea distribution for 8/1--4/1 and 5/1--4/1 tour length constraints.

A minimum shore tour length of 1 year is probably not practical because of increased PCS costs and personnel turbulence, among other reasons. Increasing the minimum sea and shore tour length to 2 years caused a significant degradation in sea distribution. In Table 5, note the drop in sea distribution for E-4s, E-5s, and E-6s when the 5/2--4/2 tour length constraints are used.

The 5/2--3/2 combination resulted in a slight improvement over the 5/2--4/2 combination. The 5/2--3/1 tour length constraint resulted in distribution not significantly different than for 5/1--4/1.

The E-7, E-8, and E-9 sea distribution simulated by the model was better for each of the above tour length constraints than that observed in FY81. However, this is not as significant as the changes demonstrated for the E-4 through E-6 pay grades; the heavy sea requirements for the midgrades, coupled with tour length constraints, make this the area of concern for rotation management.

Transition Distribution and Rotation Patterns

Changes to rotation controls result in transition effects in rotational flow and in distribution. Previous work, subsequent to that reported by Cass and Sorenson (1982), has shown, for example, that tour policy changes that would improve distribution in the steady-state could significantly degrade distribution during the transition period. Additionally, it was found that steady-state is not quickly reached. Changes to rotation controls for the early LOS population may take 20 years to affect the LOS 20+ population.

Using the model in the transition mode, it was found that the steady-state rotation flow for cohort LOS y, whose maximum time-in-tour is t, will be reached no later than year y+t after the transition commences. This means that the distribution of PRDs for any cohort may never reach steady-state due to other changes (e.g., billets, retention, promotion) to the demand/supply relationship of the distribution scenario.

However, the steady-state distribution effect is attained quickly if the rotation is controlled through annual adjustments. The annual adjustments are determined by computing the fraction of each cohort subpopulation that should be rotated to best meet the sea distribution goal within the maximum/minimum tour length constraints imposed. Table 6 shows an example of an initial distribution and the distribution changes at 1-year intervals during the transition period. Steady-state distribution was achieved by the third year, and there was no degradation of sea distribution.

Table 6

Transition Distribution

Year	E-1/3	E-4	E-5	E-6	E-7	E-8	E-9
				Sea			
0	1.07	0.65	0.50	0.54	1.26	0.40	0.72
1	1.08	0.67	0.60	0.58	1.25	0.48	0.98
2	1.08	0.66	0.60	0.58	1.25	0.48	0.98
3	1.08	0.66	0.60	0.58	1.25	0.48	0.98
4	1.08	0.66	0.60	0.58	1.25	0.48	0.98
				Shore			
0	2.47	1.19	1.11	0.62	0.71	1.56	0.84
1	1.81	0.90	0.63	0.54	0.72	1.27	0.63
2	1.83	0.93	0.66	0.54	0.72	1.27	0.63
3	1.83	0.93	0.66	0.54	0.72	1.27	0.63
4	1.83	0.93	0.66	0.54	0.72	1.27	0.63

FEASIBILITY CONSIDERATIONS

This report describes methods for improving sea/shore distribution through the dynamic control of rotational flow. Further analysis using several other detailing communities should be conducted to validate the results shown for the OS community.

If validation is successful, the question arises whether such an approach to rotation management could be practically implemented. As a minimum, additional data processing, analysis, and significant modifcation to the current process of PRD determination would be required.

Current procedures require an individual's PRD be set on assignment to a tour of duty; to implement the controlled rotation methodology in this environment would require changing a large number of PRDs each year. As a possible alternative, the individual could be informed of the maximum and minimum tour lengths for his new assignment, and that his actual rotation date will be determined based on the distribution requirements for his LOS cohort.

Each year, the desired rotational flow for the following year could be determined based on the current distribution, the rotations projected for the next 12 months, and the distribution goal determined as described above. The rotation flow for each time-in-tour subset of each cohort would be determined and PRDs for that cohort would be set accordingly. The PRD determined would be entered on the EMR for each individual selected, and each individual would be notified. To minimize conflict with the current distribution process, all PRDs should be finalized at least 12 months in advance of the desired rotation date. For example, at the end of calendar year 1983, the PRDs for all of calendar year 1984 should be finalized, and the work to control the rotation for calendar year 1985 should be underway.

CONCLUSIONS

Rotational flow is a function of tour length policy, as reflected in PRDs. Rotational flow is also a function of time and can be logically related to LOS. Sea/shore distribution is directly affected by rotational flow. This report describes a methodology for the dynamic (i.e., responsive to changing requirements) control of rotational flow to achieve a desired distribution goal. The methodology is based on an LOS-based sea distribution goal, an LOS-based maximum and minimum for tour lengths, and the rotation of LOS cohorts as a function of LOS and time-in-tour. This is a departure from the traditional approach of attempting to control rotational flow by pay grade.

Based on analysis of the OS community, recent rotation policy has resulted in a low percentage of the LOS 6-8 population at sea, causing a distribution imbalance in pay grades E-4 through E-6. High sea requirements for the pay grades with LOS 5-10 population conflict with rotation policy, which puts most of this population ashore. Long sea tours for personnel commencing sea duty at LOS 5-10 are required to compensate for the heavy shore duty population in this LOS period. Analysis indicates that the FY81 distribution for this community might have been improved if dynamically controlled rotation had been in operation in FY80.

Fixed sea/shore tour lengths by pay grade make it difficult to improve distribution. Sea/shore distribution is as sensitive to the minimum shore tour length as to the maximum sea tour length. PCS cost constraints on rotation policy make long sea and shore tour lengths desirable, but "blanket" long sea and shore tours aggravate distribution imbalances.

The steady-state simulation is useful for showing the distribution achievable under controlled rotation. However, the steady-state PRD distribution would probably never be achieved. The transition simulation demonstrates that more than 15 years is required to reach steady-state rotational flow. The dynamics of billets/personnel changes preclude the possibility of constant billets/personnel relationships over a long period of time.

The transition simulation demonstrates that controlled rotation (i.e., adjusting rotation flow annually to achieve a sea distribution goal) can improve distribution balance in a relatively brief period of time approaching the level estimated by the steady state model.

RECOMMENDATION

The controlled rotation methodology is a significant departure from current rotation policy. Feasibility assessment and implementation considerations should be based on evaluation of several representative detailing communities to find whether significant distribution improvements can be achieved and whether the methodology can be practically implemented into the distribution control and assignment process.

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